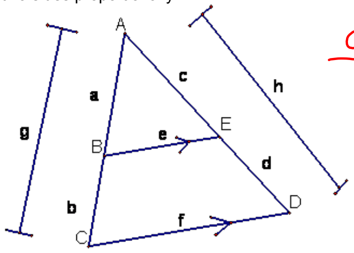
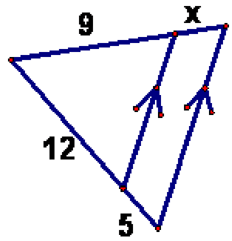
6.6 Using Proportionality Theorems

Theorem 6.4-Triangle Proportionality Theorem If a line is parallel to one side of a triangle and intersects the other two sides, then it divides the two sides proportionally.



$$\frac{a}{g} = \frac{e}{f} = \frac{c}{h}$$

$$\frac{a}{b} = \frac{c}{d}$$

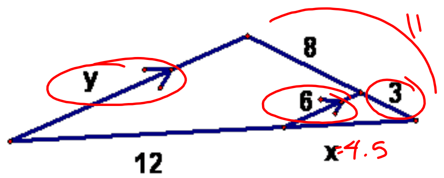


$$\frac{\cancel{9}\,3}{x} = \frac{\cancel{12}\,4}{5}$$

$$4x = 15$$

$$x = \frac{15}{4}$$

$$x = 3.75$$



$$\frac{x}{12} = \frac{3}{8}$$

$$x = 4.5$$

Parallel Sides

use ~△s

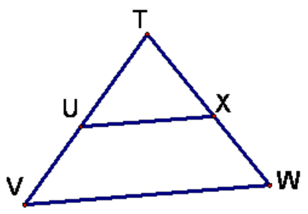
$$\frac{6}{y} = \frac{3}{11} \leftarrow *$$

$$y = 22$$

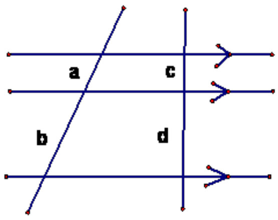
Theorem 6.5-Converse of the triangle proportionality Theorem
If a line intersects two sides of a triangle proportionally, then the line is parallel to the third side.

If $\frac{TU}{UV} = \frac{TX}{XW}$

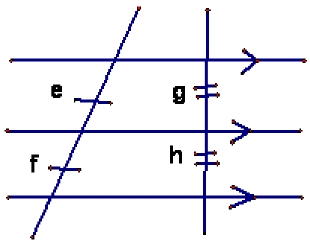
then $\overline{UX} \parallel \overline{VW}$

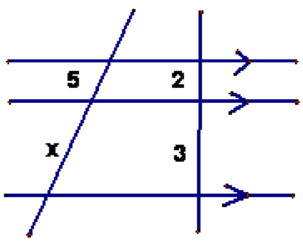


Theorem 6.6-If three or more parallel lines
intersect two transversals,
then they divide the transversals proportionally



$$\frac{a}{b} = \frac{c}{d}$$

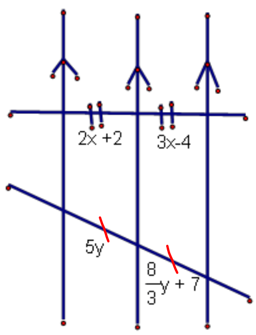




$$\frac{5}{x} = \frac{2}{3}$$

$x = 7.5$

$$\frac{x}{3} = \frac{5}{2}$$



$2x + 2 = 3x - 4$

$x = 6$

$5y = \frac{8}{3}y + 7$

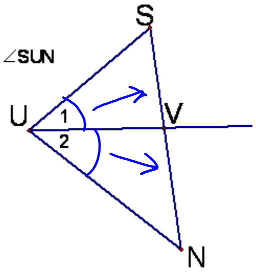
$y = 3$

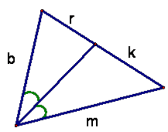
Theorem 6.7 If a ray bisects an angle in a triangle, then it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides.

$\triangle SUN$

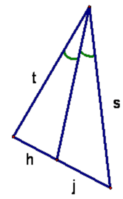
$\overrightarrow{UV}$ bisects $\angle SUN$

$$\frac{SV}{VN} = \frac{SU}{UN}$$

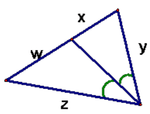


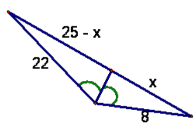


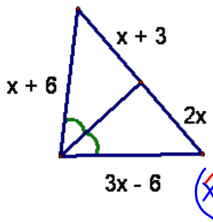
$$\frac{r}{k} = \frac{b}{m}$$



$$\frac{s}{j} = \frac{t}{h}$$





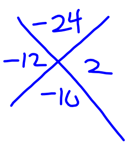


$$\frac{x+3}{x+6} = \frac{2x+1}{3x-6}$$

$(x+3)(3x-6) = (2x+1)(x+6)$

$3x^2 - 6x + 9x - 18 =$

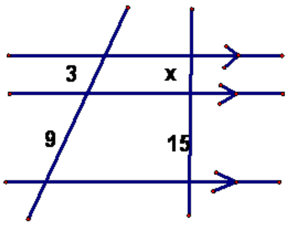
$3x^2 + 3x - 18 = 2x^2 + 13x + 6$

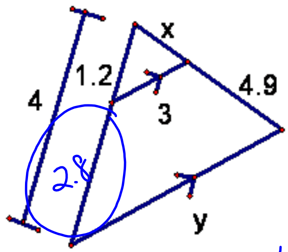


$x^2 - 10x - 24 = 0$

$(x-12)(x+2) = 0$

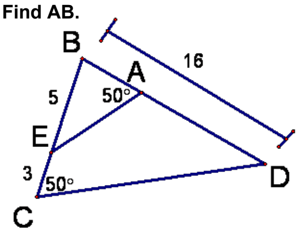
$x = 12$ $\quad \cancel{x = -2}$





$\frac{3}{4} = \frac{1.2}{4}$ $\frac{1.2}{2.8} = \frac{x}{4.9}$

Find AB.



$\triangle ABE \sim \triangle CBD$

$\frac{AB}{CB} = \frac{BE}{BD}$

$\frac{AB}{8} = \frac{5}{16}$ $AB = 2.5$